

296011US0PCTST25  
SEQUENCE LISTING

<110> KAMINSKI, PIERRE-ALEXANDRE

<120> N-DEOXYRIBOSYL TRANSFERASES OF LACTOBACILLUS FERMENTUM  
AND USE FOR THE ENZYMATIC SYNTHESIS OF  
2',3'-DIDEOXYNUCLEOSIDES AND  
2',3'-DIDEHYDRO-2',3'-DIDEOXYNUCLEOSIDES

<130> 296011US

<140> 10/594,766

<141> 2006-09-28

<150> PCT/FR05/000743

<151> 2005-03-29

<150> FR 0403319

<151> 2004-03-30

<160> 32

<170> PatentIn Ver. 3.3

<210> 1

<211> 504

<212> DNA

<213> Lactobacillus fermentum

<400> 1

```
atgaaaaata ccgacccagt tgctaacact aaaatttacc tggctaccag cttcttcaac 60
gaagaacaac gtgcccgcac ccctcaagct ctagcccaac tagaagccaa cccgactgtc 120
ggcgttggtc accagccatt cgattttcaa tataaagatg cacgcgtaga ctccgatcct 180
gccggcgctc ttggcagcct cgaatggcaa attgccactt acaataacga cctcaacgcg 240
gtaggaactt ccgatgtctg cgttgcttta tacgatatgg accaaattga cgaaggaatt 300
tgtatggaaa tcggcatggt cgtcgccctc cataaaccta tcgttttact accttttact 360
aagaaagata agtctgctta tgaagctaac ctaatgctag cacggggtgt aactacctgg 420
ttggaaccta atgacttttag tcccttaaaa gactttaact ttaaccaccc aatgggtcaa 480
ccittccac cattcaaggt tttc
```

<210> 2

<211> 168

<212> PRT

<213> Lactobacillus fermentum

<400> 2

```
Met Lys Asn Thr Asp Pro Val Ala Asn Thr Lys Ile Tyr Leu Ala Thr
 1          5          10          15
Ser Phe Phe Asn Glu Glu Gln Arg Ala Arg Ile Pro Gln Ala Leu Ala
 20          25          30
Gln Leu Glu Ala Asn Pro Thr Val Gly Val Val His Gln Pro Phe Asp
 35          40          45
Phe Gln Tyr Lys Asp Ala Arg Val Asp Ser Asp Pro Ala Gly Val Phe
 50          55          60
Gly Ser Leu Glu Trp Gln Ile Ala Thr Tyr Asn Asn Asp Leu Asn Ala
 65          70          75          80
Val Gly Thr Ser Asp Val Cys Val Ala Leu Tyr Asp Met Asp Gln Ile
 85          90          95
Asp Glu Gly Ile Cys Met Glu Ile Gly Met Phe Val Ala Leu His Lys
100          105          110
```

## 296011US0PCTST25

Pro Ile Val Leu Leu Pro Phe Thr Lys Lys Asp Lys Ser Ala Tyr Glu  
 115 120 125  
 Ala Asn Leu Met Leu Ala Arg Gly Val Thr Thr Trp Leu Glu Pro Asn  
 130 135 140  
 Asp Phe Ser Pro Leu Lys Asp Phe Asn Phe Asn His Pro Met Ala Gln  
 145 150 155 160  
 Pro Phe Pro Pro Phe Lys Val Phe  
 165

&lt;210&gt; 3

&lt;211&gt; 504

&lt;212&gt; DNA

&lt;213&gt; Lactobacillus fermentum

&lt;400&gt; 3

atgaaaaata	ccgacccagt	tgctaacact	aaaattttacc	tgactaccag	cttctttcaac	60
gaagaacaac	gtgcccgcatt	ccctcaagct	ctagcccaac	tagaagccaa	cccgactgtc	120
ggcgttggttc	accagccatt	cgattttcaa	tataaagatg	cacgcgtaga	ctccgattcct	180
gccggcgctct	ttggcagcct	cgaatggcaa	attgccactt	acaataacga	cctcaacgcg	240
gtaggaactt	ccgatgtctg	cgttgcttta	tacgatattg	accaaattga	cgaaggaatt	300
tgtatggaaa	tcggcatgtt	cgtcgccctc	cataaaccta	tcgtttttact	acctttttact	360
aagaaagata	agtctgctta	tgaagctaac	ctaagtctag	cacgggggtgt	aactacctgg	420
ttggaaccta	atgacttttag	ttccttaaaa	gactttaact	ttaaccaccc	aatggctcaa	480
ccittccac	cattcaaggt	tttc				504

&lt;210&gt; 4

&lt;211&gt; 168

&lt;212&gt; PRT

&lt;213&gt; Lactobacillus fermentum

&lt;400&gt; 4

Met	Lys	Asn	Thr	Asp	Pro	Val	Ala	Asn	Thr	Lys	Ile	Tyr	Leu	Thr	Thr
1				5					10					15	
Ser	Phe	Phe	Asn	Glu	Glu	Gln	Arg	Ala	Arg	Ile	Pro	Gln	Ala	Leu	Ala
			20					25					30		
Gln	Leu	Glu	Ala	Asn	Pro	Thr	Val	Gly	Val	Val	His	Gln	Pro	Phe	Asp
		35					40					45			
Phe	Gln	Tyr	Lys	Asp	Ala	Arg	Val	Asp	Ser	Asp	Pro	Ala	Gly	Val	Phe
	50					55					60				
Gly	Ser	Leu	Glu	Trp	Gln	Ile	Ala	Thr	Tyr	Asn	Asn	Asp	Leu	Asn	Ala
65					70					75					80
Val	Gly	Thr	Ser	Asp	Val	Cys	Val	Ala	Leu	Tyr	Asp	Met	Asp	Gln	Ile
				85					90					95	
Asp	Glu	Gly	Ile	Cys	Met	Glu	Ile	Gly	Met	Phe	Val	Ala	Leu	His	Lys
			100					105					110		
Pro	Ile	Val	Leu	Leu	Pro	Phe	Thr	Lys	Lys	Asp	Lys	Ser	Ala	Tyr	Glu
		115					120					125			
Ala	Asn	Leu	Met	Leu	Ala	Arg	Gly	Val	Thr	Thr	Trp	Leu	Glu	Pro	Asn
	130					135					140				
Asp	Phe	Ser	Pro	Leu	Lys	Asp	Phe	Asn	Phe	Asn	His	Pro	Met	Ala	Gln
145					150					155					160
Pro	Phe	Pro	Pro	Phe	Lys	Val	Phe								
				165											

<210> 5  
 <211> 39  
 <212> DNA  
 <213> Artificial Sequence

<220>  
 <223> Description of Artificial Sequence: Synthetic  
 oligonucleotide

<400> 5  
 caatttcaca caggaaacac atatgaccat gattacgcc 39

<210> 6  
 <211> 31  
 <212> DNA  
 <213> Artificial Sequence

<220>  
 <223> Description of Artificial Sequence: Synthetic  
 oligonucleotide

<400> 6  
 tgtttcctgt gtgaaattgt tatccgctca c 31

<210> 7  
 <211> 32  
 <212> DNA  
 <213> Artificial Sequence

<220>  
 <223> Description of Artificial Sequence: Synthetic  
 oligonucleotide

<400> 7  
 gatatacata tgaaaaatac cgaccagtt gc 32

<210> 8  
 <211> 39  
 <212> DNA  
 <213> Artificial Sequence

<220>  
 <223> Description of Artificial Sequence: Synthetic  
 oligonucleotide

<220>  
 <221> modified\_base  
 <222> (1)..(2)  
 <223> a, t, c, g, unknown or other

<400> 8  
 nnggatcctt aggttagtta gaaaaccttg aatggtggg 39

<210> 9  
 <211> 22  
 <212> DNA  
 <213> Artificial Sequence

<220>  
 <223> Description of Artificial Sequence: Synthetic  
 primer

<400> 9  
ttaaatacgac tcactatagg gg 22

<210> 10  
<211> 19  
<212> DNA  
<213> Artificial Sequence

<220>  
<223> Description of Artificial sequence: Synthetic primer

<400> 10  
gctagttatt gctcagcgg 19

<210> 11  
<211> 33  
<212> DNA  
<213> Artificial Sequence

<220>  
<223> Description of Artificial sequence: Synthetic oligonucleotide

<220>  
<221> modified\_base  
<222> (1)  
<223> a, t, c, g, unknown or other

<400> 11  
ngatatacat atgaaaaata ccgacccagt tgc 33

<210> 12  
<211> 39  
<212> DNA  
<213> Artificial Sequence

<220>  
<223> Description of Artificial sequence: Synthetic oligonucleotide

<220>  
<221> modified\_base  
<222> (1)..(2)  
<223> a, t, c, g, unknown or other

<400> 12  
nnggatacctt aggttagtta gaaaaccttg aatggtggg 39

<210> 13  
<211> 33  
<212> PRT  
<213> Lactobacillus acidophilus

<400> 13  
Met Met Ala Lys Thr Lys Thr Leu Tyr Phe Gly Ala Gly Trp Phe Asn  
1 5 10 15  
Glu Lys Gln Asn Lys Ala Tyr Lys Ala Ala Met Glu Ala Leu Lys Gln  
20 25 30

Asn

&lt;210&gt; 14

&lt;211&gt; 32

&lt;212&gt; PRT

&lt;213&gt; Lactobacillus helveticus

&lt;400&gt; 14

Met Asn Lys Lys Lys Thr Leu Tyr Phe Gly Ala Gly Trp Phe Asn Glu  
 1 5 10 15  
 Lys Gln Asn Lys Ala Tyr Lys Glu Ala Met Ala Ala Leu Lys Glu Asn  
 20 25 30

&lt;210&gt; 15

&lt;211&gt; 31

&lt;212&gt; PRT

&lt;213&gt; Lactobacillus leichmannii

&lt;400&gt; 15

Met Pro Lys Lys Thr Ile Tyr Phe Gly Ala Gly Trp Phe Thr Asp Arg  
 1 5 10 15  
 Gln Asn Lys Ala Tyr Lys Glu Ala Met Glu Ala Leu Lys Glu Asn  
 20 25 30

&lt;210&gt; 16

&lt;211&gt; 31

&lt;212&gt; PRT

&lt;213&gt; Lactobacillus leichmannii

&lt;400&gt; 16

Met Pro Lys Lys Thr Ile Tyr Phe Ser Ala Gly Trp Phe Thr Asp Arg  
 1 5 10 15  
 Gln Asn Lys Ala Tyr Lys Glu Ala Met Glu Ala Leu Lys Glu Asn  
 20 25 30

&lt;210&gt; 17

&lt;211&gt; 35

&lt;212&gt; PRT

&lt;213&gt; Lactobacillus helveticus

&lt;400&gt; 17

Met Lys Ala Val Val Pro Thr Gly Lys Ile Tyr Leu Gly Ser Pro Phe  
 1 5 10 15  
 Tyr Ser Asp Ala Gln Arg Glu Arg Ala Ala Lys Ala Lys Glu Leu Leu  
 20 25 30  
 Ala Lys Asn  
 35

&lt;210&gt; 18

&lt;211&gt; 22

&lt;212&gt; PRT

&lt;213&gt; Lactobacillus gasseri

&lt;400&gt; 18

Met Thr Lys Gln Lys Thr Val Tyr Phe Gly Ala Gly Trp Phe Thr Glu  
 1 5 10 15

Thr Gln Asn Lys Ala Tyr  
20

<210> 19  
<211> 37  
<212> PRT  
<213> Lactobacillus fermentum

<400> 19  
Leu Lys Asn Thr Asp Pro Val Ala Asn Thr Lys Ile Tyr Leu Ala Thr  
1 5 10 15  
Ser Phe Phe Asn Glu Glu Gln Arg Ala Arg Ile Pro Gln Ala Leu Ala  
20 25 30  
Gln Leu Glu Ala Asn  
35

<210> 20  
<211> 37  
<212> PRT  
<213> Lactobacillus fermentum

<400> 20  
Leu Lys Asn Thr Asp Pro Val Ala Asn Thr Lys Ile Tyr Leu Thr Thr  
1 5 10 15  
Ser Phe Phe Asn Glu Glu Gln Arg Ala Arg Ile Pro Gln Ala Leu Ala  
20 25 30  
Gln Leu Glu Ala Asn  
35

<210> 21  
<211> 32  
<212> PRT  
<213> Oenococcus oeni

<400> 21  
Met Asn Met Ala Lys Asn Ile Tyr Leu Ala Ser Pro Phe Phe Asp Asp  
1 5 10 15  
Glu Gln Ile Ala Arg Val Lys Lys Ile Glu Lys Ala Leu Glu Ser Asn  
20 25 30

<210> 22  
<211> 28  
<212> PRT  
<213> Leuconostoc mesenteroides

<400> 22  
Lys Asn Val Tyr Leu Ala Ser Pro Phe Phe Asp Lys Glu Gln Ile Glu  
1 5 10 15  
Arg Val Glu Arg Val Glu Lys Ala Leu Ala Ala Asn  
20 25

<210> 23  
<211> 26  
<212> PRT

<213> *Lactobacillus plantarum*

<400> 23

Val Tyr Leu Ala Ala Pro Phe Phe Asp Glu Ala Gln Lys Glu Arg Ile  
1 5 10 15

Gln Gln Val Lys Ser Ala Leu Leu Ala Asn  
20 25

<210> 24

<211> 20

<212> PRT

<213> *Lactobacillus lactis*

<400> 24

Asn Gln Ala Val Asn Val Tyr Leu Ala Ala Pro Phe Phe Ser Glu Ser  
1 5 10 15

Gln Ile Lys Lys  
20

<210> 25

<211> 158

<212> PRT

<213> *Lactobacillus helveticus*

<400> 25

Met Asn Lys Lys Lys Thr Leu Tyr Phe Gly Ala Gly Trp Phe Asn Glu  
1 5 10 15

Lys Gln Asn Lys Ala Tyr Lys Glu Ala Met Ala Ala Leu Lys Glu Asn  
20 25 30

Pro Thr Val Asp Leu Glu Asn Ser Tyr Val Pro Leu Glu Asn Gln Tyr  
35 40 45

Lys Gly Ile Arg Ile Asp Glu His Pro Glu Tyr Leu His Asn Ile Glu  
50 55 60

Trp Ala Ser Ala Thr Tyr His Asn Asp Leu Val Gly Ile Lys Thr Ser  
65 70 75 80

Asp Val Met Leu Gly Val Tyr Leu Pro Glu Glu Glu Asp Val Gly Leu  
85 90 95

Gly Met Glu Leu Gly Tyr Ala Leu Ser Gln Gly Lys Tyr Ile Leu Leu  
100 105 110

Val Ile Pro Asp Glu Asp Tyr Gly Lys Pro Ile Asn Leu Met Ser Trp  
115 120 125

Gly Val Cys Asp Asn Ala Ile Lys Ile Ser Glu Leu Lys Asp Phe Asp  
130 135 140

Phe Asn Lys Pro Arg Tyr Asn Phe Tyr Asp Gly Ala Val Tyr  
145 150 155

<210> 26

<211> 159

<212> PRT

<213> *Lactobacillus acidophilus*

<400> 26

Met Met Ala Lys Thr Lys Thr Leu Tyr Phe Gly Ala Gly Trp Phe Asn  
1 5 10 15

## 296011US0PCTST25

Glu Lys Gln Asn<sub>20</sub> Lys Ala Tyr Lys Ala<sub>25</sub> Ala Met Glu Ala Leu<sub>30</sub> Lys Gln  
 Asn Pro Thr<sub>35</sub> Val Asp Leu Glu Asn<sub>40</sub> Ser Tyr Val Pro Leu<sub>45</sub> Glu Asn Gln  
 Tyr Lys<sub>50</sub> Asp Ile Arg Val Asp<sub>55</sub> Glu His Pro Glu Tyr<sub>60</sub> Leu His Asp Ile  
 Glu<sub>65</sub> Trp Ala Ser Ala Thr<sub>70</sub> Tyr His Asn Asp Leu<sub>75</sub> Ile Gly Ile Lys Ser<sub>80</sub>  
 Ser Asp Ile Met Leu<sub>85</sub> Gly Val Tyr Leu Pro<sub>90</sub> Glu Glu Glu Asp Val<sub>95</sub> Gly  
 Leu Gly Met Glu<sub>100</sub> Leu Gly Tyr Ala Leu<sub>105</sub> Ser Gln Gly Lys Tyr<sub>110</sub> Ile Leu  
 Leu Val Ile<sub>115</sub> Pro Asp Glu Asp Tyr<sub>120</sub> Gly Lys Pro Ile Asn<sub>125</sub> Leu Met Ser  
 Trp Gly<sub>130</sub> Val Cys Asp Asn Ala<sub>135</sub> Ile Lys Ile Ser Glu<sub>140</sub> Leu Lys Asp Phe  
 Asp<sub>145</sub> Phe Asn Lys Pro Arg<sub>150</sub> Phe Asn Phe Tyr Asp<sub>155</sub> Gly Ala Val Tyr

&lt;210&gt; 27

&lt;211&gt; 149

&lt;212&gt; PRT

&lt;213&gt; Lactobacillus johnsonii

&lt;400&gt; 27

Met Ala Gly Trp Phe<sub>5</sub> Thr Glu Thr Gln Asn<sub>10</sub> Lys Ala Tyr Lys Asp Ala<sub>15</sub>  
 Met Ser Ala Leu<sub>20</sub> Asn Ala Asn Pro Thr<sub>25</sub> Ile Asp Leu Glu Asn Ser Tyr  
 Val Pro Leu<sub>35</sub> Gln Asn Gln Tyr Lys<sub>40</sub> Asp Ile Arg Val Asp<sub>45</sub> Glu His Pro  
 Glu Tyr<sub>50</sub> Leu His Asp Lys Glu<sub>55</sub> Trp Ala Gln Ala Thr<sub>60</sub> Tyr Asn Gly Asp  
 Leu Val Gly Ile Lys Thr<sub>70</sub> Ser Asp Val Met Leu<sub>75</sub> Gly Val Tyr Val Pro<sub>80</sub>  
 Lys Glu Glu Asp Val<sub>85</sub> Gly Leu Gly Met Glu<sub>90</sub> Leu Gly Tyr Ala Met<sub>95</sub> Ser  
 Gln Gly Lys Tyr<sub>100</sub> Val Leu Leu Val Ile<sub>105</sub> Pro Asp Glu Leu Tyr<sub>110</sub> Gly Glu  
 Ser Ile Asn<sub>115</sub> Leu Met Ser Trp Gly<sub>120</sub> Val Ala Asp Asn Val<sub>125</sub> Ile Lys Met  
 Ser Glu<sub>130</sub> Leu Ala Thr Phe Asp<sub>135</sub> Phe Asn Arg Pro Arg<sub>140</sub> Tyr Asn Phe Tyr  
 Asp Gly Ala Val Tyr  
 145

&lt;210&gt; 28

&lt;211&gt; 157



## 296011US0PCTST25

&lt;212&gt; PRT

&lt;213&gt; Lactobacillus leichmannii

&lt;400&gt; 28

Met Pro Lys Lys Thr Ile Tyr Phe Gly Ala Gly Trp Phe Thr Asp Arg  
 1 5 10 15  
 Gln Asn Lys Ala Tyr Lys Glu Ala Met Glu Ala Leu Lys Glu Asn Pro  
 20 25 30  
 Thr Ile Asp Leu Glu Asn Ser Tyr Val Pro Leu Asp Asn Gln Tyr Lys  
 35 40 45  
 Gly Ile Arg Val Asp Glu His Pro Glu Tyr Leu His Asp Lys Val Trp  
 50 55 60  
 Ala Thr Ala Thr Tyr Asn Asn Asp Leu Asn Gly Ile Lys Thr Asn Asp  
 65 70 75 80  
 Ile Met Leu Gly Val Tyr Ile Pro Asp Glu Glu Asp Val Gly Leu Gly  
 85 90 95  
 Met Glu Leu Gly Tyr Ala Leu Ser Gln Gly Lys Tyr Val Leu Leu Val  
 100 105 110  
 Ile Pro Asp Glu Asp Tyr Gly Lys Pro Ile Asn Leu Met Ser Trp Gly  
 115 120 125  
 Val Ser Asp Asn Val Ile Lys Met Ser Gln Leu Lys Asp Phe Asn Phe  
 130 135 140  
 Asn Lys Pro Arg Phe Asp Phe Tyr Glu Gly Ala Val Tyr  
 145 150 155

&lt;210&gt; 29

&lt;211&gt; 168

&lt;212&gt; PRT

&lt;213&gt; Lactobacillus fermentum

&lt;400&gt; 29

Leu Lys Asn Thr Asp Pro Val Ala Asn Thr Lys Ile Tyr Leu Ala Thr  
 1 5 10 15  
 Ser Phe Phe Asn Glu Glu Gln Arg Ala Arg Ile Pro Gln Ala Leu Ala  
 20 25 30  
 Gln Leu Glu Ala Asn Pro Thr Val Gly Val Val His Gln Pro Phe Asp  
 35 40 45  
 Phe Gln Tyr Lys Asp Ala Arg Val Asp Ser Asp Pro Ala Gly Val Phe  
 50 55 60  
 Gly Ser Leu Glu Trp Gln Ile Ala Thr Tyr Asn Asn Asp Leu Asn Ala  
 65 70 75 80  
 Val Gly Thr Ser Asp Val Cys Val Ala Leu Tyr Asp Met Asp Gln Ile  
 85 90 95  
 Asp Glu Gly Ile Cys Met Glu Ile Gly Met Phe Val Ala Leu His Lys  
 100 105 110  
 Pro Ile Val Leu Leu Pro Phe Thr Lys Lys Asp Lys Ser Ala Tyr Glu  
 115 120 125  
 Ala Asn Leu Met Leu Ala Arg Gly Val Thr Thr Trp Leu Glu Pro Asn  
 130 135 140

## 296011US0PCTST25

Asp Phe Ser Pro Leu Lys Asp Phe Asn Phe Asn His Pro Met Ala Gln  
 145 150 155 160

Pro Phe Pro Pro Phe Lys Val Phe  
 165

<210> 30

<211> 167

<212> PRT

<213> Lactobacillus helveticus

<400> 30

Met Lys Ala Val Val Pro Thr Gly Lys Ile Tyr Leu Gly Ser Pro Phe  
 1 5 10 15

Tyr Ser Asp Ala Gln Arg Glu Arg Ala Ala Lys Ala Lys Glu Leu Leu  
 20 25 30

Ala Lys Asn Leu Ser Ile Ala His Val Phe Phe Pro Phe Asp Asp Gly  
 35 40 45

Phe Thr Asp Pro Asp Glu Lys Asn Pro Glu Ile Gly Gly Ile Arg Ser  
 50 55 60

Met Val Trp Arg Asp Ala Thr Tyr Gln Asn Asp Leu Thr Gly Ile Ser  
 65 70 75 80

Asn Ala Thr Cys Gly Val Phe Leu Tyr Asp Met Asp Gln Leu Asp Asp  
 85 90 95

Gly Ser Ala Phe Glu Ile Gly Phe Met Arg Ala Met His Lys Pro Val  
 100 105 110

Ile Leu Val Pro Phe Thr Glu His Pro Glu Lys Glu Lys Lys Met Asn  
 115 120 125

Leu Met Ile Ala Gln Gly Val Thr Thr Ile Ile Asp Gly Asn Thr Glu  
 130 135 140

Phe Glu Lys Leu Ala Asp Tyr Asn Phe Asn Glu Cys Pro Phe Asn Pro  
 145 150 155 160

Val Arg Gly Tyr Gly Ile Tyr  
 165

<210> 31

<211> 146

<212> PRT

<213> Leuconostoc mesenteroides

<400> 31

Met Ser Gln Ile Tyr Leu Ala Gly Pro Phe Phe Ser Asp Glu Gln Ile  
 1 5 10 15

Asp Arg Val Lys Arg Ile Glu Ala Ala Leu Asp Ser Asn Pro Thr Val  
 20 25 30

Thr Asp Tyr Tyr Ser Pro Arg Lys His Gln Lys Thr Glu Asn Pro Glu  
 35 40 45

Phe Thr Ser Pro Trp Ala Ala Glu Val Phe Gln Arg Asp Ile Lys Asn  
 50 55 60

Val Thr Asp Ala Asp Ile Ile Leu Ser Ile Ile Asp Tyr Arg Asp Asn  
 65 70 75 80

296011US0PCTST25

Asp Ala Asp Ser Gly Thr Ala Phe Glu Gln Gly Met Ala Trp Val Gln  
85 90 95

Lys Lys Pro Ile Ile Val Phe Asn Glu Leu Lys Phe Pro Val Asn Leu  
100 105 110

Met Leu Ser Glu Ser Leu Thr Ala Tyr Ile Thr Asn Ser Asp Asp Ile  
115 120 125

Ala Thr Tyr Asp Phe Asp Gln Thr Pro Lys Leu Pro Phe Thr Gly Glu  
130 135 140

Leu Phe  
145

<210> 32  
<211> 154  
<212> PRT  
<213> Prochlorococcus marinus

<400> 32  
Met Thr Arg Lys Ile Ile Tyr Leu Ala Ser Pro Tyr Gly Phe Ser Lys  
1 5 10 15

Gln Cys Lys Lys Asn Leu Leu Pro Glu Phe Ile Ala Ala Leu Glu Asp  
20 25 30

Leu Gly Ala Glu Val Trp Glu Pro Phe Ser Arg Asn Ala Gln Tyr Glu  
35 40 45

Asn Leu Gln Pro Gly Trp Ala His Asp Ile Ala Leu Ala Asp Leu Arg  
50 55 60

Asp Val Arg Asn Ser Asp Gly Ile Leu Ala Val Val Asn Gly Thr Pro  
65 70 75 80

Pro Asp Glu Gly Val Met Ile Glu Leu Gly Ala Ala Ile Ala Leu Gly  
85 90 95

Lys Pro Thr Phe Leu Phe Arg Asp Asp Phe Arg Arg Cys Ser Asp Ser  
100 105 110

Glu Glu Tyr Pro Leu Asn Leu Met Leu Phe Ala Gly Leu Pro Ser Ile  
115 120 125

Gly Trp Asn Asp Tyr Phe Tyr Thr Ser Ile Glu Glu Leu Ser Asp Pro  
130 135 140

Lys Lys Ser Leu Ala Ile Trp Leu Lys Asp  
145 150